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Section:

8. Analysis

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Asymptotic of means

Divided differences $(M_p - M_q)/(M_r - M_s)$ of the power, symmetric and some other mean values of $\mathbf{x} = (x_1, \dots, x_n)$ have C^∞ extension $(p - q)/(r - s)$ to $\mathbf{a} = (a, \dots, a)$. For $M = \varphi^{-1}(\sum u_i \varphi(x_i))$ the extension is $(\phi_1 - \phi_2)/(\phi_3 - \phi_4)$, $\phi = \varphi''/\varphi'$. Equivalently, the partial derivatives satisfy $\sum_\alpha M_{ij\alpha}(\mathbf{a}) = \phi^{(k)}(a) u_i(\delta_{ij} u_j)$, where α denotes sequences of length k from $1, \dots, n$. Asymptotic linearity of the homogeneous means $M_p \sim M_1 + (p-1)(M_1 - M_0)$, $\mathbf{x} \to \mathbf{a}$, can be placed in the infinity $\mathbf{x} + \mathbf{a}$, $a \to \infty$, which strengthens Hoehn and Niven asymptotic property. Higher differences, the asymptotic of directional derivative, some asymptotic relations, and other families of means will be presented.

References: M. Bjelica, Fixed point and inequalities, thesis, Belgrade, 1990; R. P. Boas, and J. L. Brenner, The asymptotic behaviour of inhomogeneous means, *J. Math. Anal. Appl.* **123** (1987), 262–264.